$^{40}Ar/^{39}Ar$ AGE OF HORNBLENDE-BEARING R CHONDRITE LAP 04840.

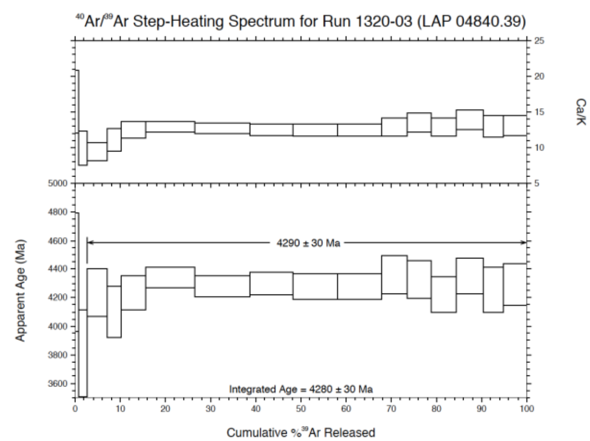
K. Righter[1] and M. Cosca[2] [1]Mailcode XI2, NASA Johnson Space Center, 2101 NASA Pkwy., Houston, TX 77058; [2]US Geological Survey, Denver Federal Center, MS 963, Denver, CO 80225.

Introduction: Chondrites have a complex chronology due to several variables affecting and operating on chondritic parent bodies such as radiogenic heating, pressure and temperature variation with depth, aqueous alteration, and shock or impact heating [1]. Unbrecciated chondrites can record ages from 4.56 to 4.4 Ga that represent cooling in small parent bodies. Some brecciated chondrites exhibit younger ages (<<4 to 4.4 Ga) that may reflect the age of brecciation, disturbance, or shock and impact events (<< 4 Ga).

A unique R chondrite was recently found in the LaPaz Icefield of Antarctica – LAP 04840 [2]. This chondrite contains ~15% hornblende and trace amounts of biotite, making it the first of its kind. Studies have revealed an equigranular texture, mineral equilibria yielding equilibration near 650-700 ºC and 250-500 bars, hornblende that is dominantly OH-bearing (very little Cl or F), and high D/H ratios [3,4,5]. To help gain a better understanding of the origin of this unique sample, we have measured the $^{40}Ar/^{39}Ar$ age (LAP 04840 split 39).

Results: The $^{40}Ar/^{39}Ar$ experiments were conducted at the U.S. Geological Survey in Denver, CO. Individual grains of amphibole were separated by crushing and hand-picking and loaded into platinum tubes and irradiated in the central thimble position of the USGS TRIGA reactor for 80 mega watt hours. The biotite GA1550 was used as the standard. Samples were evacuated within a custom built stainless steel extraction line, incrementally heated using a 25 W CO_2 laser, exposed to a cryogenic trap maintained at -130 ºC and a hot SAES GP50 getter and then expanded into a Thermo Fisher ARGUS-VI mass spectrometer. Argon isotopes (40, 39, 38, 37, 36) were analyzed in two separate experimental configurations. One grain was analyzed in multi-collection mode, with all argon isotopes measured simultaneously during 300 seconds of data collection, and another grain was analyzed using only the ion counter in peak hopping mode during 10 cycles of data collection. Both experiments yielded identical $^{40}Ar/^{39}Ar$ plateau ages of 4290 +/- 30 Ma (2 sigma); only the age spectrum obtained from the multi collection experiment is presented here. Ages were calculated after correction for blanks, detector intercalibration (<0.1%), radioactive decay subsequent to irradiation, and interfering nucleogenic reactions.

Discussion: The plateau age of 4290 +/- 30 Ma is younger than one would expect for a sample that has cooled within a small body [6], and one might instead attribute the age to a younger shock event. On the other hand, there is no evidence for extensive shock in this meteorite (shock stage S2; [3]), so this sample may have been re-annealed after a shock event. Indeed, detailed textural and petrographic studie of LAP 04840 have revealed evidence for post-shock annealing [7], which is consistent with the chronologic data obtained here. This age is similar to Ar-Ar ages determined for some other R chondrites [8,9]. R chondrites in general have yielded older impact ages (or annealing ages) than most other ordinary chondrites which show a wide range of ages from 4.4 to <1.0 Ga [10].



References: [1] Bogard, D. (2011) Chemie der Erde-Geoch. 71, 207-226. [2] Satterwhite, C.E. and Righter, K. (2006) Ant. Met. Newsl. 29, no. 1. [3] McCanta, M. et al (2008) GCA 72, 5757-5780. [4] Righter, K. and Neff, K. (2007) Polar Sci. 1, 25-44; [5] Ota, K., et al. (2009) J. Mineral. Petrol. Sci. 104, 215-225; [6] Bennett and McSween, H.Y., Jr. (1996) MaPS 31, 783–792. [7] Rubin, A.E. (2014) MaPS 45, 1057-1075; [8] Dixon, E. et al (2003) MaPS 38, 341-355. [9] Nagao,

K. et al (1999) Ant. Met. Res. 12, 81-93; [10] Swindle, T. et al. (2014) *Geol. Soc. Lon. Sp. Pub. 378*, 333-347.